



ROBOTICS UPDATE

"Providing network-integrated robotic solutions for C4ISR applications."

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SSC SD Demos Unmanned Systems to JRP Working Group

The Joint Robotics Program (JRP) recently held its quarterly Working Group meeting at San Diego in December 2003. The JRP provides focus and coordination to the development of systems and technologies that provide 21st century land forces with a family of highly mobile and multi-missioned unmanned vehicles. Through the sharing of multi-platform technology, ensuring systems and parts commonality, utilizing a joint architecture, and focusing technology-base development, more optimal use of program resources can be achieved.



MDARS-E SDD poised just outside of SSC SD's ROCC.

Center (ROCC). The Mobile Detection Assessment Response System (MDARS) UGVs, developed for the Program Manager, Force Protection Systems (PM-FPS) performed autonomous security missions for a blue force using the Multiple Resource Host Architecture (MRHA) to simultaneously control heterogeneous unmanned systems.



Robin Laird presents branch brief in SSC SD's ROCC.

The Man Portable Robotic System (MPRS) URBOT performed remote surveillance as it entered the ROCC for the red force. In a demonstration of Integrated Force Protection, UGVs and



Mike Bruch controls USV from remote location.

fixed sensors provided situational awareness, while unattended munitions provided a less-than-lethal response capability. Remote resources interfaced with legacy physical devices such as manned response vehicles, barrier gates, fence openings, garage doors, and remote power on/off for unmanned systems.



SSC SD's USV patrolling off the Point Loma coastline.

SSC SD successfully demonstrated its experimental USV off Point Loma's Pacific coast. The USV was teleoperated by an operator using the Multiple-robot Operator Control Unit (MOCU) with a real-time video link. Video was actively stabilized by spe-

cial hardware on the USV. Most of the electronic hardware and control software used on the USV is identical to that developed for the URBOT, which facilitated a relatively easy integration with MOCU. SSC SD is currently working on porting waypoint navigation algorithms from the URBOT to the USV, as well as adding a digital radar to support obstacle avoidance experimentation.



29-inch iSTAR UAV launched from AUMS atop MDARS.

The Autonomous UAV Mission System (AUMS) project demonstrated its latest prototype launch/recovery module. A 29-inch iSTAR (tethered for safety) was launched from atop MDARS using an automatic release mechanism developed by University of California, San Diego and SSC SD engineers. The purpose of the AUMS project is to create a system that will increase the effectiveness of small UAVs by providing flexibility in deployment, and automation of operations, including release, recovery, and refueling. ♦



Al Nease, Chief of Force Protection Branch, AFRL (l), and Eugene "Cliff" Hudson (r), JRP Coordinator, observe the UGV/UAV flight demo at SSC SD.

While in San Diego, attendees visited SSC San Diego (SSC SD) for a brief on the Unmanned Systems Branch's mission and vision, an overview of current collaborative efforts and projects, and a narrated Force-on-Force Demonstration in the Robotic Operations Command

Segway RMP - A New Mobile Robot Base

Adapted from a Segway Human Transporter, the Robotic Mobility Platform (RMP) is a new mobile robot base that is faster, cheaper, and can carry greater payloads than existing comparable robotic platforms.

Initiated by Defense Advanced Research Projects Agency's Information Processing Technology Office, SSC SD provided technical oversight and coordination of 15 HT i Series conversions by Segway, LLC.

In addition to its own technical research and development RMP efforts, SSC SD coordinates training, storage, allocation, and distribution of the RMPs to several robotics research institutions nationwide. The new ge-

ometry of this platform presents researchers with an opportunity to examine novel topics, including actuation modalities and people-height sensing.

(Continued on page 2)

JAUS Experiment Successful

Unmanned vehicle engineers from eight organizations collaborated on the Joint Architecture for Unmanned Systems (JAUS) OCU and Payloads Committee (OPC) Experiment 1 at SSC SD in early December 2003. US Army Aviation & Missile Research, Development, & Engineering Center (AMRDEC) led the planning, execution, and data analysis for this experiment. Participants included Air Force Research Laboratory, Naval Surface Warfare Center-Panama City, Air Force Combat Support Systems Program Office, iRobot, Remotec, Autonomous Solutions, Apple Aid, and SSC SD. Unmanned systems, consisting of a UGV and its operator control unit (OCU), included URBOT, PackBot, Matilda, Eel, Andros, and TAGS.



JAUS engineers with man-portable robots - URBOT, Packbot, Matilda, and Eel

JAUS (www.jauswg.org) is a component-based message-passing architecture that specifies data formats and methods of communication among computing nodes. It defines messages and component behaviors that are independent of technology, computer hardware, operator use, and vehicle platforms, and isolated from mission. The JAUS Working Group is responsible for defining and implementing the architecture across a variety of unmanned vehicles, sensors, and munitions.

Under direction received from the JRP, the OPC's goal is to provide human factors engineering and software architecture guidance to the JAUS community. The OPC is focused on expediting the production of the most effective interoperable robotic systems, payloads, and user control devices. A continuous series of experiments are

planned to expedite development of a recommendation to the JAUS WG, and also to collect information on performance



Tactical Amphibious Ground Support (TAGS) System

and effectiveness of current and recommended approaches. This first experiment collected information on JAUS Level 1 compliance (subsystem interfaces). The JAUS Reference Architecture V3.0 was the primary interface control document. The JAUS OPC Experiment Plan defined the transport layer protocol and dynamic registration implementation.



Andros MARK V-A1 - over 600 EOD units in service

The overall result of this experiment was successful validation of an existing message set. Each OCU was able to monitor status of all UGVs over a wireless network; any OCU was able to take exclusive control of any UGV and drive it using teleoperation commands. Tim Cable, Remotec Project Engineer, stated, "I'm sure the robotics industry and the JAUS initiative will both have substantial benefits from the successes at SPAWAR."♦

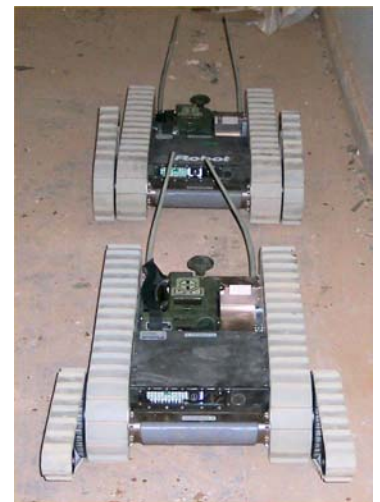
CHARS Payload Deployed

SSC SD recently developed a chemical/radiological sensor (CHARS) package for the US Army Chemical School at Fort Leonard Wood, Missouri, designed to ultimately be plug-and-play on different robots (e.g., URBOT and Matilda). The package includes three standard-issue sensors: the MultiRAE (hazmat environmental gas sensor), the Joint Chemical Agent Detector (JCAD-nerve, blister and blood agents sensor), and the AN/UDR-13 Radiac (gamma/neutron detector).



SSC SD CHARS prototype installed on an URBOT.

In August 2003, the US Army XVIII Airborne Corps at Fort Bragg, North Carolina, re-



PackBots equipped with CHARS deployed to IRAQ.

quested support for robotically deployed chemical and radiological sensor systems for use in Iraq to search for potentially hazardous agents. SSC SD issued a contract to iRobot to build four CHARS packages containing all of the sensors and functionalities of the SSC SD prototype for installation on their PackBot platform. Four PackBot Scouts equipped with CHARS payloads were delivered to the Army for deployment to Iraq in early November 2003.♦

Segway RMP (Continued)



The RMP base is adapted from Segway's HT technology.

Research institutions currently experimenting with Segway RMPs (under bailment agreement with SSC SD) include: CMU, Georgia Tech, MIT, NASA JSC, NRL, USC, Neurosciences

Institute, Stanford, Vanderbilt, and the Universities of Massachusetts, Michigan, and Pennsylvania.

For more information on the Segway RMP program, visit www.spawar.navy.mil/robots/land/SegwayRMP/SegwayRMP.html ♦

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